CLAIMS

1. A diamond coated tool comprising a substrate and a diamond coating formed on the surface of the substrate, wherein:

said substrate is made of a cemented carbide or a cermet;

diamond grains constituting a growth surface of said diamond coating has an average grain size of about 1.5 micrometers or below;

said diamond coating has a thickness ranging from about 0.1 micrometer to 20 micrometers; and

said diamond coating has an average surface roughness Ra ranging from about 0.01 micrometer to 0.2 micrometer.

2. A diamond coated tool according to claim 1, wherein:

said diamond grains are formed of an aggregation of diamond fine grains; and

said diamond fine grains are disposed as elongated fine grains extending longitudinally in a growth direction of the diamond coating in cross-section thereof and have a minor axis diameter in the rage of about 0.001 micrometer to 0.1 micrometer

3. A diamond coated tool according to claim 2, wherein said diamond fine grains have an aspect ratio ranging from about 2 to 20.

4. A diamond coated tool according to claim 2, wherein at least a part of said fine diamond grains are formed like leaves of Japanese cedar in shape.

5. A diamond coated tool according to claim 1, wherein said diamond coating satisfies the relationship between the peak height D for diamond

and the peak height G for graphite or an amorphous carbon in a Raman spectroscopic analysis:

$$\text{about } 0.5 \leqq D/G \leqq \text{about } 5.$$

6. A diamond coated tool according to claim 1, wherein said diamond coating has a ratio I_{220}/I_t not smaller than about 0.6, where I_{220} is a peak intensity of the diamond crystal face (220) and I_t is a total of peak intensities of diamond crystal faces (111), (220), (311), (400) and (331) as observed in X-ray diffractometry of said diamond coating.

7. A diamond coated tool according to claim 1, wherein said diamond coating has a hydrogen content in the range of about 1% to 5% by atomic ratio (at%).

8. A diamond coated tool according to claim 1, wherein said diamond coating is formed as a single layer in a cross-sectional zone of about 70 % of its thickness above the substrate surface.

9. A diamond coated tool according to claim 1, wherein said substrate comprises a cemented carbide containing about 0.1 mass % to 6 mass % of Co.

10. A diamond coated tool according to claim 1, wherein said substrate has a magnitude of saturation magnetization not smaller than 1,900 × (binding phase content of alloy (by mass %)) / 100 ($G \cdot cm^3/g$) but not greater than 2,023 × (binding phase content of alloy (by mass %)) / 100 ($G \cdot cm^3/g$).

11. A diamond coated tool according to claim 9, wherein said substrate having its Co content partially substituted with Cr has a magnitude of saturation magnetization not smaller than 1,900 × (binding phase content of alloy (by mass %))/100 ($G \cdot cm^3/g$) × 0.93 but not greater than 2,023 ×

(binding phase content of alloy (by mass %))/100 ($G \cdot cm^3/g$).

12. A diamond coated tool according to claim 9, wherein said diamond coating is formed partially on the substrate surface, and said substrate has a magnitude of saturation magnetization Ms satisfying the following condition A in its area that is at least about 5 mm apart outside from the outer border of the diamond coating along the substrate surface:

A: 1,900 × (binding content of alloy (mass %)) / 100 ($G \cdot cm^3/g$) ≦ Ms ≦ 2,023 × (binding content of alloy (mass %)) / 100 ($G \cdot cm^3/g$).

13. A diamond coated tool according to claim 9, wherein:

said substrate has its Co content partially substituted with Cr;

said diamond coating is formed partially on the substrate surface; and

said substrate has a magnitude of saturation magnetization Ms satisfying the following condition B in its area that is at least about 5 mm apart outside from the outer border of the diamond coating along the substrate surface:

B: 1,900 × (binding content of alloy (mass %)) / 100 × 0.93 ($G \cdot cm^3/g$) ≦ Ms ≦ 2,023 × (binding content of alloy (mass %)) / 100 ($G \cdot cm^3/g$).

14. A diamond coated tool according to claim 1, wherein said diamond coating has surface unevenness in the range of about 15 nm to 200 nm in RMS (root mean square) value as measured by an atomic force microscope.

15. A diamond coated tool according to claim 1, wherein said substrate has in its outer zone closer to its surface a composition having a binding phase content lower than that in its inner area inside the outer

zone, and the outer zone ranges from about 1 micrometer to 20 micrometers in depth

16. A diamond coated tool according to claim 1, wherein diamond coating is provided as it is produced through a vapor-phase synthesis process.

17. A method of manufacturing a diamond coated tool, the method comprising:

preparing a substrate of a cemented carbide or a cermet having substantially a shape of the intended tool;

carburizing said substrate; and

coating the substrate with diamond in an atmosphere of a hydrogen-hydrocarbon mixed gas under pressure of about 0.13-6.5 kPa.

18. A method of manufacturing a diamond coated tool according to claim 17, further comprising a diamond application step for applying a diamond not larger than about 500 (50 nm) in average grain size to the surface of said substrate after said carburizing.

19. A method of manufacturing a diamond coated tool according to claim 17, wherein said diamond applied in said application step comprises a polycrystalline diamond

20. A method of manufacturing a diamond coated tool according to claim 17, further comprising an acid treatment step for treating the substrate surface with an acid to partially remove the binding phase metal, said acid treatment step being interposed between said carburization step and said diamond application step.